

WHAT IS CLAIMED IS:

1. An explosive composition having a total composition weight, the explosive composition comprising:

about 70 weight percent to about 90 weight percent 2,4,6,8,10,12-hexanitro-2,4,6,8,10,12-hexaazatetracyclo[5.5.0.0^{5,9}.0^{3,11}]-dodecane (CL-20) based on the total composition weight;

about 0 weight percent to about 10 weight percent of at least one nitramine, other than the CL-20, based on the total composition weight; and

about 10 weight percent to about 20 weight percent of at least one silicone fluid, the silicone fluid present in an effective amount for establishing the explosive composition as a paste at room temperature.

2. An explosive composition according to claim 1, wherein the CL-20 constitutes 70 weight percent to 80 weight percent of the total composition weight

3. An explosive composition according to claim 1, wherein the nitramine constitutes 1 weight percent to 10 weight percent of the total composition weight.

4. An explosive composition according to claim 3, wherein the nitramine comprises a member selected from the group consisting of 1,3,5-trinitro-1,3,5-triaza-cyclohexane (RDX), 1,3,5,7-tetranitro-1,3,5,7-tetraaza-cyclooctane (HMX), and 4,10-dinitro-2,6,8,12-tetraoxa-4,10-diazatetracyclo[5.5.0.0.0^{5,9}.0^{3,11}]-dodecane (TEX).

5. An explosive composition according to claim 3, wherein the nitramine comprises 1,3,5,7-tetranitro-1,3,5,7-tetraaza-cyclooctane (HMX).

6. An explosive composition according to claim 1, wherein the nitramine constitutes 5 weight percent to 10 weight percent of the total composition weight.

7. An explosive composition according to claim 1, wherein the silicone fluid comprises a homopolymer selected from the group consisting of dimethylsiloxane, methylphenylsiloxane, polysilane, methylvinylsiloxane, and diphenylsiloxane.

8. An explosive composition according to claim 1, wherein the silicone fluid comprises a copolymer comprising repeating units of at least two members selected from the group consisting of dimethylsiloxane, methylphenylsiloxane, polysilane, methylvinylsiloxane, and diphenylsiloxane.

9. An explosive composition according to claim 1, wherein the silicone fluid has a room temperature viscosity in the range of about 350 centistokes to about 5000 centistokes.

10. An explosive composition according to claim 1, wherein the explosive composition is formulated to have a calculated detonation pressure of 246 kbar or higher, and a cylinder expansion energy of 6.92 kJ/cc or higher.

11. An explosive composition according to claim 1, wherein the explosive composition is formulated to have a softening point lower than 0°C, as measured by a probe force of 500 mN.

12. An explosive composition according to claim 1, wherein the explosive composition is formulated to have a softening point lower than -20°C, as measured by a probe force of 500 mN.

13. A method for loading a warhead case with a shapeable charge, the method comprising:

injecting an explosive paste through an injection passageway or runner into the warhead, the explosive paste having a total weight and comprising

about 70 weight percent to about 90 weight percent

2,4,6,8,10,12-hexanitro-2,4,6,8,10,12-hexaazatetracyclo[5.5.0.0^{5,9}0^{3,11}]-

dodecane (CL-20) based on the total weight;

about 0 weight percent to about 10 weight percent of at least one nitramine, other than the CL-20, based on the total weight; and

about 10 weight percent to about 20 weight percent of at least one silicone fluid based on the total weight.

14. A method according to claim 13, wherein the CL-20 constitutes 70 weight percent to 80 weight percent of the total weight.

15. A method according to claim 13, wherein the nitramine constitutes 1 weight percent to 10 weight percent of the total weight.

16. A method according to claim 15, wherein the nitramine is selected from the group consisting of 1,3,5-trinitro-1,3,5-triaza-cyclohexane (RDX), 1,3,5,7-tetranitro-1,3,5,7-tetraaza-cyclooctane (HMX), and 4,10-dinitro-2,6,8,12-tetraoxa-4,10-diazatetracyclo-[5.5.0.0.5,90^{3,11}]-dodecane (TEX).

17. A method according to claim 15, wherein the nitramine comprises 1,3,5,7-tetranitro-1,3,5,7-tetraaza-cyclooctane (HMX).

18. A method according to claim 13, wherein the nitramine constitutes 5 weight percent to 10 weight percent of the total weight.

19. A method according to claim 13, wherein the silicone fluid comprises at least one homopolymer selected from the group consisting of

dimethylsiloxane, methylphenylsiloxane, polysilane, methylvinylsiloxane, and diphenylsiloxane.

20. A method according to claim 13, wherein the silicone fluid comprises at least one copolymer comprising repeating units of at least two members selected from the group consisting of dimethylsiloxane, methylphenylsiloxane, polysilane, methylvinylsiloxane, and diphenylsiloxane.

21. A method according to claim 13, wherein the silicone fluid has a room temperature viscosity in the range of about 350 centistokes to about 5000 centistokes.

22. A method according to claim 13, wherein the explosive paste is formulated to have a calculated detonation pressure of 246 kbar or higher, and a cylinder expansion energy of 6.92 kJ/cc or higher.

23. A method according to claim 13, wherein the explosive paste is formulated to have a softening point lower than 0°C, as measured by a probe force of 500 mN.

24. A method according to claim 13, wherein the explosive paste is formulated to have a softening point lower than -20°C, as measured by a probe force of 500 mN.

25. An explosive composition having a total weight, said explosive composition comprising:

composition C-4 comprising

about 45 weight percent to about 69 weight percent RDX based on the total weight of the explosive composition; and

about 0.5 weight percent to about 2.25 weight percent polyisobutylene based on the total weight of the explosive composition; and

an additive composition comprising
about 15 weight percent to about 30 weight percent
2,4,6,8,10,12-hexanitro-2,4,6,8,10,12-hexaazatetracyclo[5.5.0.0^{5,9}.0^{3,11}]-
dodecane (CL-20) based on the total weight of the explosive composition; and
about 15 weight percent to about 25 weight percent
bis(dinitropropyl)acetal and bis(dinitropropyl)formal (BDNPA/F) based on the
total weight of the explosive composition.

26. An explosive composition according to claim 25, wherein the CL-20 constitutes 15 weight percent to 20 weight percent of the total weight of the explosive composition, and wherein the BDNPA/F constitutes 15 weight percent to 19 weight percent of the total weight of the explosive composition.

27. An explosive composition according to claim 25, wherein a weight ratio of the composition C-4 to the additive composition is in a range of 1:1 to 3:1.

28. An explosive composition according to claim 25, wherein the additive composition further comprises at least one binder swellable in the BDNPA/F, and at least one silicone fluid.

29. An explosive composition according to claim 28, wherein the binder comprises at least one member selected from the group consisting of cellulose esters, polyethers, and polyurethanes.

30. An explosive composition according to claim 28, wherein the binder comprises cellulose acetate butyrate.

31. An explosive composition according to claim 28, wherein the silicone fluid comprises at least one homopolymer selected from the group consisting of dimethylsiloxane, methylphenylsiloxane, polysilane, methylvinylsiloxane, and diphenylsiloxane.

32. An explosive composition according to claim 28, wherein the silicone fluid comprises at least one copolymer comprising repeating units of at least two members selected from the group consisting of dimethylsiloxane, methylphenylsiloxane, polysilane, methylvinylsiloxane, and diphenylsiloxane.

33. An explosive composition according to claim 28, wherein the silicone fluid has a room temperature viscosity in the range of about 350 centistokes to about 5000 centistokes.

34. An explosive composition according to claim 25, wherein the explosive composition is formulated to have a calculated detonation pressure of 246 kbar or higher, and a cylinder expansion energy of 6.92 kJ/cc or higher.

35. An explosive composition according to claim 25, wherein the explosive composition is formulated to have a softening point lower than 0°C, as measured by a probe force of 500 mN.

36. An explosive composition according to claim 25, wherein the explosive composition is formulated to have a softening point lower than -20°C, as measured by a probe force of 500 mN.

37. A method for loading a warhead case with a shapeable charge, said method comprising:

injecting an explosive paste through an injection passageway or runner into the warhead, the explosive paste comprising composition C-4 and an additive composition, wherein

the composition C-4 comprises

about 45 weight percent to about 69 weight percent RDX based on the total weight of the explosive paste; and
about 0.5 weight percent to about 2.25 weight percent

polyisobutylene based on the total weight of the explosive paste; and
the additive composition comprises
about 15 weight percent to about 30 weight percent
2,4,6,8,10,12-hexanitro-2,4,6,8,10,12-hexaazatetracyclo[5.5.0.0^{5,9}.0^{3,11}]-
dodecane (CL-20) based on the total weight of the explosive paste; and
about 15 weight percent to about 25 weight percent
bis(dinitropropyl)acetal and bis(dinitropropyl)formal (BDNPA/F) based on the
total weight of the explosive paste.

38. A method according to claim 37, wherein the CL-20 constitutes
15 weight percent to 20 weight percent of the total weight of the explosive
composition, and wherein the BDNPA/F constitutes 15 weight percent to 19
weight percent of the total weight of the explosive composition.

39. A method according to claim 37, wherein a weight ratio of the
composition C-4 to the additive composition is in a range of 1:1 to 1:3.

40. A method according to claim 37, wherein the additive
composition further comprises at least one binder swellable in the BDNPA/F,
and at least one silicone fluid.

41. A method according to claim 40, wherein the binder comprises at
least one member selected from the group consisting of cellulose esters,
polyethers, and polyurethanes.

42. A method according to claim 40, wherein the binder comprises
cellulose acetate butyrate.

43. A method according to claim 40, wherein the silicone fluid
comprises at least one homopolymer selected from the group consisting of
dimethylsiloxane, methylphenylsiloxane, polysilane, methylvinylsiloxane,
and diphenylsiloxane.

44. A method according to claim 40, wherein the silicone fluid comprises at least one copolymer comprising repeating units of at least two members selected from the group consisting of dimethylsiloxane, methylphenylsiloxane, polysilane, methylvinylsiloxane, and diphenylsiloxane.

45. A method according to claim 40, wherein the silicone fluid has a viscosity in the range of about 350 centistokes to about 5000 centistokes.

46. A method according to claim 37, wherein the explosive paste is formulated to have a calculated detonation pressure of 246 kbar or higher, and a cylinder expansion energy of 6.92 kJ/cc or higher.

47. A method according to claim 37, wherein the explosive paste is formulated to have a softening point lower than 0°C, as measured by a probe force of 500 mN.

48. A method according to claim 37, wherein the explosive paste is formulated to have a softening point lower than -20°C, as measured by a probe force of 500 mN.

49. A method of modifying composition C-4, comprising:
providing composition C-4;

combining the composition C-4 with an additive composition comprising 2,4,6,8,10,12-hexanitro-2,4,6,8,10,12-hexaazatetracyclo[5.5.0.0^{5,9}0^{3,11}]-dodecane (CL-20) and bis(dinitropropyl)acetal and bis(dinitropropyl)formal (BDNPA/F) to obtain an explosive composition having a total weight,

wherein the CL-20 constitutes about 15 weight percent to about 30 weight percent of the total weight of the explosive composition, and wherein

the BDNPA/F constitutes about 15 weight percent to about 25 weight percent of the total weight of the explosive composition.

50. A method according to claim 49, wherein the composition C-4 comprises about 90 weight percent to about 92 weight percent RDX and about 1 weight percent to about 3 weight percent polyisobutylene.

51. A method according to claim 49, wherein the CL-20 constitutes 15 weight percent to 20 weight percent of the total weight of the explosive composition, and wherein the BDNPA/F constitutes 15 weight percent to 19 weight percent of the total weight of the explosive composition.

52. A method according to claim 49, wherein the additive composition further comprises at least one binder swellable in the BDNPA/F, and at least one silicone fluid.

53. A method according to claim 52, wherein the binder comprises at least one member selected from the group consisting of cellulose esters, polyethers, and polyurethanes.

54. A method according to claim 52, wherein the binder comprises cellulose acetate butyrate.

55. A method according to claim 52, wherein the silicone fluid comprises at least one homopolymer selected from the group consisting of dimethylsiloxane, methylphenylsiloxane, polysilane, methylvinylsiloxane, and diphenylsiloxane.

56. A method according to claim 52, wherein the silicone fluid comprises at least one copolymer comprising repeating units of at least two members selected from the group consisting of dimethylsiloxane,

methylphenylsiloxane, polysilane, methylvinylsiloxane, and diphenylsiloxane.

57. A method according to claim 49, wherein the explosive composition is formulated to have a softening point lower than 0°C, as measured by a probe force of 500 mN.

58. A method according to claim 49, wherein the explosive composition is formulated to have a softening point lower than -20°C, as measured by a probe force of 500 mN.